

June 10, 1992

TO : Secretary  
FM : Chief, Frequency Allocation Branch, OET  
RE : June 5 Filing of Ellipsat

Attached are (1) Letter dated June 5 from Jill Abeshouse Stern, Counsel for Ellipsat, to Donna Searcy, Secretary, FCC; (2) Letter dated June 10 from David R. Siddall, Chief, Frequency Allocation Branch, OET to Jill Abeshouse Stern, Esq.; and (3) "Selected Press Coverage" (packet of press clippings). This material should be filed in Docket 92-28, PP-30. I have removed the material for which confidential treatment was sought pursuant to paragraph 1 of the June 5 letter.

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IN REPLY REFER TO:

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Jill Abeshouse Stern, Esq.  
Shaw, Pittman, Potts & Trowbridge  
2300 N Street, N.W.  
Washington, DC 20037

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Re: Request of Ellipsat Corporation that Information Filed  
on June 5, 1992, Relating to ET Docket No. 92-28,  
PP-30, be Withheld From Public Inspection

Dear Ms. Stern:

This responds to your letter of June 5, 1992, in which you request that information you filed that relates to a June 2, 1992 patent application of Ellipsat Corporation be protected from public disclosure pursuant to 47 C.F.R. § 0.457(d) as trade secrets and commercial information that customarily would not be released to the public.

You are advised that the Chief Engineer has delegated to me responsibility for responding to your request and that I have reviewed the material in question. Pursuant to Section 0.457(d), I have determined that the substance of the information contained in the submission already has been placed in the public record by Ellipsat, see, e.g., the above-referenced letter itself and Application for Authority to Construct Ellipso<sup>tm</sup> II dated June 3, 1991, at pp. 24-40.

Accordingly, I have determined that the information you have filed subject to a request for confidential treatment does not constitute a trade secret or commercial information that customarily would not be released to the public. Therefore, I deny your request for confidential treatment, and consistent with your request made pursuant to 47 C.F.R. § 0.459(e), I am returning herewith the only copy submitted of the material marked confidential.

Sincerely,

*David R. Siddall*  
David R. Siddall, Chief  
Frequency Allocation Branch

Enclosure

cc: Counsel for Applicants:  
AMSC, Constellation, LQSS,  
Motorola, & TRW Inc.

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June 5, 1992

JILL A. STERN  
(202) 663-8380

Ms. Donna Searcy  
Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

Dear Ms. Searcy:

On behalf of Ellipsat Corporation, I am enclosing supplemental information that further supports Ellipsat's claim of entitlement to a pioneer's preference as the first applicant to file a concrete and innovative system proposal. These materials are as follows.

1. Information about a patent application, filed June 2, 1992, by Ellipsat in connection with its ELLIPSO™ satellite system. This information is protected from disclosure by Commission Rule 0.457(d) as trade secrets and commercial information that would not customarily be released to the public. To the extent necessary, Ellipsat specifically requests that the information not be made routinely available for public inspection. The confidential information is being submitted in a sealed envelope with a copy of this letter attached. Ellipsat is willing to make the confidential material available under the terms of the Protective Order, DA 92-674, released May 28, 1992. If this request for confidentiality is not granted, Ellipsat requests that the materials be returned.

While there are additional materials that Ellipsat could submit about its system, the enclosed materials have been carefully selected to document those unique innovations that are central to Ellipsat's system design, its preference claim and the Commission's objectives. Ellipsat sees no reason to submit materials relating solely to design of specific system components, like power management systems and hand-off procedures, that would be part of the implementation of any low-earth orbit system.

2. Selected press coverage about the Ellipsat system demonstrating the innovative nature of its system and the fact that Ellipsat was the first of the large LEOS to file a concrete application at the Commission. A recent Space News article is included, which documents the serious consideration being given

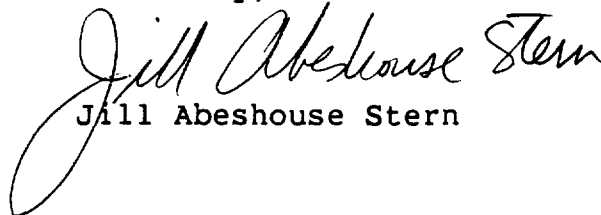
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Ms. Donna Searcy  
June 5, 1992  
Page 2

to elliptical orbits in connection with various international satellite systems, including ESA's Archimedes project, following Ellipsat's application.

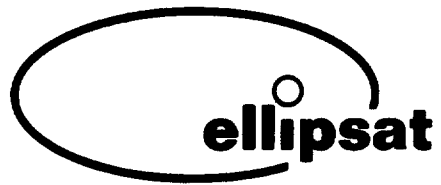
Should there be any questions concerning this matter, kindly communicate with the undersigned.

Sincerely,



Jill Abeshouse Stern

JAS:csg  
Enclosures  
cc: See attached list



**SELECTED PRESS COVERAGE**

# ESA Archimedes Project To Use Elliptical Orbits

By ROHINA RICCIETIELLO  
Space News Staff Writer

PARIS — The European Space Agency is developing plans for a satellite with an unusual elliptical orbit that researchers say is especially suitable for mobile telephone service and high-quality radio transmission to Europe, Canada, and parts of the northern United States and the Far East.

ESA officials hope to launch the first of six Archimedes satellites by 1998, possibly in a cooperative program with Canada, Japan and the United States.

Plans remain very preliminary, however, and discussions are just beginning with Canada and Japan, said Rene Collette, ESA's director of telecommunications programs.

An elliptical orbit is advantageous for mobile communications because the spacecraft can be almost directly overhead for as much as four hours at a time, said Alain Pinglier, coordinator of ESA's telecommunications program. A satellite orbiting overhead is easier to access, especially for mobile users in cars, who can encounter interference from tall buildings that can block the signals sent by geostationary satellites when they are at a low angle to the horizon.

The Archimedes satellites also could carry a meteorological payload to provide accurate weather analysis of the northern latitudes, Collette said.

ESA has estimated the cost to develop a demonstration Archimedes satellite to be about 400 million European Currency Units (about \$491 million), Pinglier said. ESA has only budgeted about 200 million ECU (about \$250 million), creating a need for extra funding from individual ESA member countries or other

space agencies over a five-year period.

Additional Archimedes satellites would cost much less to build, because all the design and development work would already be done, Pinglier said.

Elliptical orbit satellites have piqued the interest of various satellite users, who are attracted by the advantages they offer, he said. But most users have adopted a wait-and-see attitude and are not eager to experiment with the unusual orbit themselves.

The International Maritime Satellite Organization (Inmarsat), for example, has discussed using a highly elliptical orbit satellite for a possible future system that would help navigators pinpoint their exact location.

"Geostationary satellites by themselves, no matter how many you put up, really don't provide you the geometry to do positioning worldwide," said Jim Nagle, group leader for navigation services at Inmarsat in London. "What you really need to get good geometry to determine positioning is both geostationary and highly elliptical orbit satellites."

Nagle said Inmarsat would not consider launching its own highly elliptical orbit satellite, but might be interested in adding a navigation capability to a satellite built by another organization.

ESA has attempted to gauge potential interest in the Archimedes project by meeting with broadcasters, Pinglier said. Archimedes satellites would offer a radio signal that would compare in quality to a compact disc recording, he said.

"The idea appeals to them, per se, but they want to be convinced," he said.

Pinglier said a single channel offering coverage of most of Eu-

rope could cost less than \$1 million a year on a highly elliptical orbit satellite. Leasing a transponder on a geostationary satellite can cost at least \$5 million in Europe.

But the Archimedes program faces some tough challenges, including assuring that it has a worldwide frequency. The World Administrative Radio Conference recently designated the L-band frequencies for satellite radio broadcasting, but some of those frequencies are already occupied and will not be fully available until 2007.

Pinglier said if Archimedes were launched in 1998, ESA probably could find a clear section of the L-band frequency for its use.

However, the United States has opposed satellite radio broadcasting in the L-band frequency, because the U.S. military uses it for ground-based communications.

ESA has not yet approached the United States to discuss an Archimedes-type system. But another drawback for potential U.S. involvement is Archimedes' coverage, which would be concentrated on the northern United States.

Despite the challenges in convincing the U.S. to participate, Collette said he is eager to start negotiating with NASA on the Archimedes proposal.

"We hope the new NASA administration will put some emphasis again on advanced communications systems. Joint development is badly needed in promoting new things that are still too esoteric for businessmen," Collette said. "Space agencies should break the ice in these new fields."

The Archimedes program marks a departure from ESA's traditional focus on developing

new technologies, because it would use existing technology. ESA's interest lies in pushing a new way of using current technology, Collette said.

The Archimedes satellites, which would resemble traditional geostationary spacecraft in design, would orbit the Earth in a long, narrow oval pattern, covering wide areas of Europe, North America and the Far East each day. For example, six satellites operating in an eight-hour orbit would provide 24-hour coverage. The satellites would reach their highest point, or apogee, over Europe, North America and the Far East, at an altitude of 20,000 to 25,000 kilometers (12,000 to

15,000 miles), said Pinglier. On the opposite side of the orbit, in the southern hemisphere, the spacecraft would descend to an altitude of 800 to 1,000 kilometers. That part of the orbit would be useless, however, because the satellites would be traveling very quickly on their way back to the northern hemisphere, he said.

The Soviet Union has depended on its highly elliptical orbit Molniya satellites since 1965 for telephone, telegraph and television transmission. The satellites have a 12-hour orbital period, which allows them to remain over the former Soviet Union for as much as eight hours at a time.

## Norway, GTE Plan Business Networks

By ROHINA RICCIETIELLO  
Space News Staff Writer

PARIS — Norwegian Telecom and GTE Spacetel Corp. plan to start a service that will allow banks, car dealerships, retail stores and other businesses to communicate via satellite within Norway and throughout Europe, officials said.

The system, Norstat Plus, will enable Norwegian companies to send and receive business information among their branch offices using very small satellite dishes, known as VSATs, Jerry Wayman, president of GTE Spacetel Corp., said in a telephone interview.

The service is expected to

begin operating this fall.

The agreement calls for GTE Spacetel to supply software, hardware and satellite ground station equipment to Norwegian Telecom, which is based in Oslo. The McLean, Va., company also will help train Norwegian Telecom employees and will share its secrets for marketing VSAT business links, Wayman said. The company has installed some 50,000 VSATs worldwide, about half of those in the United States, he said.

Norway already uses a specially designed system that operates with the Intelsat satellite for its domestic telecommunications system.

# WARC World Impact: New Systems Get Spectrum Assignments

Worldwide allocations for new generation of LEOs, other services point to expanded satellite universe.

by Lou Manuta  
Washington Bureau Chief

**O**n October 12, 1993, new international frequency allocations for mobile satellite, personal communications and broadcast satellite sound will all go into affect. The regional and worldwide spectrum assignments for those telecommunications initiatives are the result of some forty days of intensive international negotiations in Malaga-Torremolinos, Spain, site of the World Administrative Radio Conference (WARC).

Jan W. Baran, United States Ambassador to the WARC which ended March 4, said "the Conference was a major success for the U.S." For nearly five weeks, 1400 delegates from 127 of the International Telecommunications Union's 166 nations met in Spain to discuss frequency allocations for new technologies. WARC-92 was the first major frequency allocation conference to be held since 1979 when the all world-wide Radio Regulations were reviewed.

During the 1980s, the ITU organized four WARCs: two concerning the mobile spectrum (in 1983 and 1987), one held in two sessions on geostationary satellites (in 1985 and 1988), and one in two sessions on high-frequency broadcasting (in 1984 and 1987). Because none of these WARCs were able to substantially modify or extend the bands allocated to their respective services,

frequency allocation changes had to be addressed at subsequent meetings.

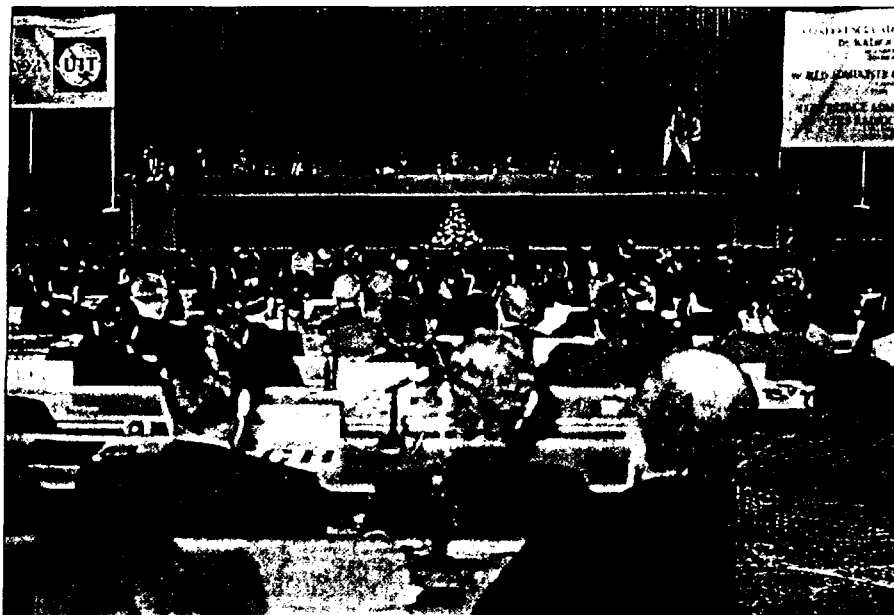
## Preparing for WARC-92

In 1990, the ITU Administrative

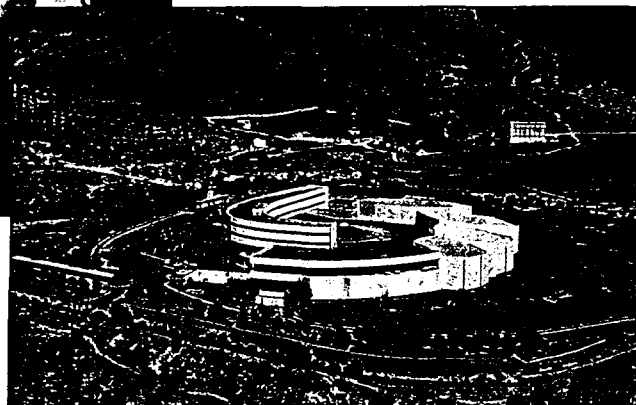
Council drew up the agenda for WARC-92 to address potential modifications to the International Table of Frequency Allocations. WARC-92 was asked to address the spectrum requirements for mobile and fixed services, Broadcast Satellite Service (BSS-sound), High Definition Televi-

[illegible]

**Source: The Communications Center**



*(Left) The WARC delegates hammer out new policies; (below) The Palacio de Congresos in Malaga-Torremolinos, Spain was the site of the 1992 WARC.*



sion (HDTV), and Future Public Land Mobile Telephone Service (FPLMTS), which includes the Personal Communications Service (PCS).

In the official U.S. report, allocations were also requested for low-earth orbiting (LEO) satellites, both above and below GHz. The LEO proposals above 1 GHz were for global voice telecommunication services such as those proposed by Motorola, Constellation, Ellipsat, TRW, and Qualcomm. (See System comparison chart on next page). LEO satellites below 1 GHz would be used primarily for low-data rate communications, such as messaging and position location, to handheld receivers. Companies involved with the so-called small, light satellites or "Little LEOs" include Orbcomm, Starsys, and VITA.

Other than the LEO proposals, numerous recommendations were made for the Mobile Satellite Service (MSS), HDTV, FPLMTS, PCS, Fixed Satellite Service (FSS), and intersatellite space services above 20 GHz.

The process for selecting the United States allocation proposals began in late 1989 with the first of three requests by the FCC for comments from the private sector. As a part of this process, an industry advisory committee was established to make its own proposals. From these varied sources, the agency made its recommendations for

private usage of the satellite services and filed a report with the Department of State, the official United States' representative to WARC-92. Simultaneously, the Interagency Radio Advisory Committee, composed of those governmental agencies which use radio spectrum, informed the National Telecommunications and Information Administration (NTIA) which frequencies the government would prefer to employ for specific services. The State Department then reviewed the materials from the FCC and NTIA and finalized its report.

## The WARC Begins

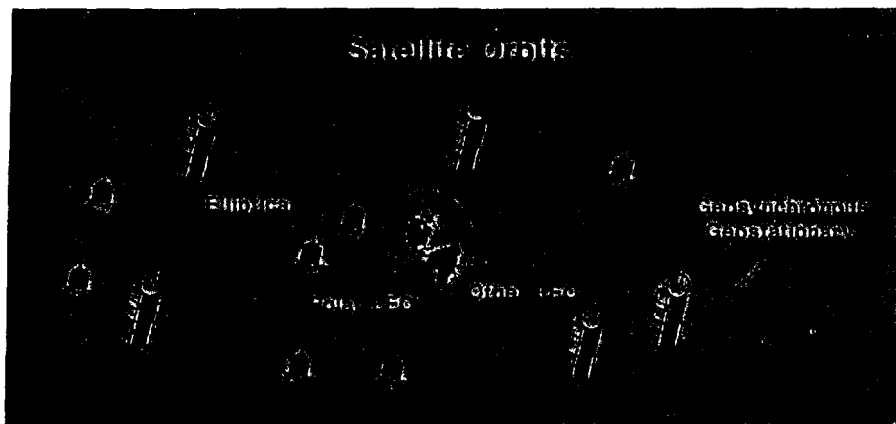
Some fifty-two representatives, made up of government personnel and members of the private sector, were named to the U.S. delegation. In addition, another 25 or 30 U.S. representatives of the different interested companies attended the WARC as "special advisors." The official and unofficial U.S. delegation made the trek to Spain for the February 3rd commencement of the Conference and were asked to divide their extended 10-12 hour work days to six committees and one plenary working group. These committees, in turn, were divided into working

groups where the majority of the negotiations and discussions occurred.

For example, Working Group 4B was asked to consider proposals related to mobile communications between 137 MHz and 1 GHz (direct sound broadcasting, LEO satellite systems, in-flight telephone/fax service for passengers of commercial airlines, and FPLMTS); Working Group 4C discussed allocations for satellite delivered HDTV as well as space services above 20 GHz and uplinks for BSS (sound); and Working Group 5B examined BSS (sound) generally, and the need to eliminate or reduce significantly emissions from non-geostationary satellites which interfere with geostationary satellites so that the rule be made applicable to both mobile and fixed satellites. The Working Group of the Plenary offered technical advice to the different groups.

Not surprisingly, most progress was made in the last 48 hours of the Conference. However, Leslie Taylor, a member of the U.S. delegation stated that throughout the WARC there was "a real spirit of cooperation" and, although numerous di-





Source: The Communications Center

verse proposals were presented, there was "a sense that the countries had to work together to maximize the ability of all countries to achieve their goals."

"A major move forward at WARC-92," Taylor added, "was the willingness of most countries to consider the benefits of new technology and to strive to find a combination of global and regional allocations as well as timetables and technical constraints to permit the introduction of new services over a period of time."

For non-LEO mobile satellite services (MSS), the band 20.1-20.2 GHz and 29.9-30 GHz was upgraded to primary status, providing worldwide allocation for multi-purpose satellite networks using narrow spot beam antennas, and other advanced base station technology. Similar additional upgrades were made in region 2 for the bands 19.7 to 20.1 GHz, and 29.5 to 29.9 GHz. Several additions, as well as alternate allocations, were made through footnotes for a number of countries in respect of MSS.

## New Alliances

A new dynamic at the Spain WARC was the coordinated effort of the 32-member nations of CEPT (Committee of European Post and Telecommunications). They single-mindedly pursued the development of standards for terrestrial mobile service to the exclusion of allocations for satellite services. According to Ambassador Baran, they were "unenthusiastic about the U.S. pro-

posals." Since the ITU operates on a one-vote-per-country basis, the formation of a bloc this large gave the Europeans great weight in receiving authorization for their proposals. Because the primary goal of the United States was to receive adequate allocations for its satellite proposals, especially for LEOs, the CEPT voting block proved to be a challenge. In the end, sufficient spectrum for the LEOs was allocated.

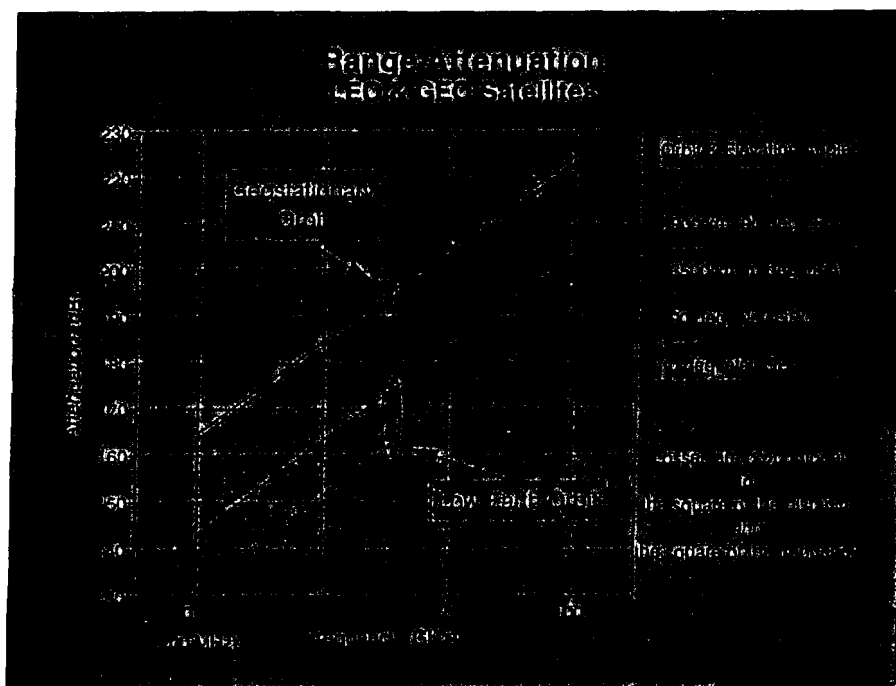
In addition, Africa and the Middle East emerged as a bloc towards the end of the Conference, behind the leadership of Morocco. The Moroccan delegation complained that the concerns of lesser-developed nations were not being taken into account,

especially in the areas of LEO satellites and BSS (sound). By the end of the Conference the U.S. was able to convince many developing countries to support their LEO proposals because "advanced technologies" in certain parts of the world were also "appropriate technologies" where traditional landline telephone service was either nonexistent or inadequate. Additionally, the CEPT was able to break the deadlock with the United States concerning BSS (sound) spectrum by eventually supporting the Moroccan allocation request in the 1.5 GHz band.

## The Importance of the Allocations

One of the critical policy issues addressed at WARC concerned existing services getting protection against harmful interference from newly introduced services. These problems were solved through the establishment of a coordination procedure between geostationary mobile satellites and the new LEO systems, and by designating some frequencies for secondary usage, as opposed to a primary allocation.

Additionally, the WARC adopted a resolution seeking technical, legal, and operational studies which will



Source: The Communications Center

lead to the establishment of standards governing the operation of LEO satellites "so as to ensure equitable and standard conditions of access for all ITU members and to guarantee proper worldwide protection for existing services and systems." The WARC Resolution also stated that only a limited number of LEO systems which offer worldwide coverage can co-exist in any given frequency band, and further, standards will be necessary for the coordination, sharing, and operation of these systems.

## The Next Generation of LEOs

**Little LEOs:** The primary allocations for the small LEOs were: 137-137.025 MHz, 137.175-137.825 MHz, 148-149.9 MHz, and 400.15-401 MHz. Secondary allocations were granted in the 137.025-137.175 MHz and 137.825-138 MHz bands. A primary worldwide allocation for mobile satellites was also made for the land mobile satellite service in the 149.9-150.05 MHz band, subject to the coordination procedures. In addition, a secondary allocation in the 312-315 MHz and 387-390 MHz bands was made for mobile satellites (including LEO), subject to coordination.

Alan Renshaw, program manager at Starsys, stated that "careful engineering studies by acknowledged experts in broadcast technologies demonstrated that sophisticated frequency sharing techniques would reduce impact by the new services on existing ones to an acceptable minimum. . . . Unfamiliarity with this technique [Code Division Multiple Access] and its effects led some delegations initially to oppose the frequency allocation request, [but] we worked very hard to demonstrate convincingly that the fears of most countries were unfounded."

Alan Parker, the president of Orbital Communications Corp. (Orbcomm) called the results at WARC-92 "a hands down victory." He cited six points on how the outcome from WARC will benefit the Little LEOs: (1) the allocation will permit the satellites to transmit from

space-to-Earth worldwide without coordination in some instances; (2) financing will be easier to obtain because the LEOs will have primary status; (3) the allocation will be sufficient for multiple entries; (4) an international interest in little LEO services was confirmed; (5) should a proposed Russian LEO system ever materialize, it will not hinder the commercial Little LEO systems because it has only a secondary allocation and there appears to not be much potential for United States or European approval of the system; and (6) the FCC licensing process can now proceed without delay. He envisions the LEOs below 1 GHz providing global positioning and emergency data transmissions, as well as enhancing terrestrial SMRs and VHF Marine Radio. In addition, he foresees systems such as Orbcomm complementing the use of palmtop computers by providing the necessary spectrum for the transmission of information between portable terminals. Parker expects a mid-1993 launch for the little LEOs, provided the FCC acts quickly. Global coverage should be realized by the end of 1994.



Baran

## Other Allocations for MSS

**Large LEO's:** For satellites of the MSS operating above 1 GHz (including Big LEO), allocations were made in bands near 1.5, 1.6, and 2 GHz. In the 1.5 GHz band, a new primary allocation was made to the maritime mobile satellite service at 1525 to 1530 MHz in region 1. In addition, in the band 1525-1530 MHz, a new primary allocation was made to the mobile satellite service in regions 2 and 3, as well as a secondary allocation to the land mobile satellite service in region 1. An additional primary allocation was also made for region 2 in the bands 1492 to 1525 MHz band.

In the bands near 1.6 GHz, a new worldwide primary allocation was

made to the MSS in the bands 1610 to 1626.5 MHz (earth to space) paired with 2483.5 to 2520 MHz (space to earth). As these bands are also used by the global navigation systems for civil aviation (the U.S. Global Positioning Service and the Russian GLONASS), MSS-based networks will have to be subject to the coordination procedure developed for non-GSO and will also be subject to footnotes providing the appropriate technical safeguards.

Furthermore, an additional worldwide allocation in the bands 1613.8 to 1626.5 MHz was made on a secondary basis for MSS, as well as an additional primary allocation in the bands 1675 to 1710 MHz for region 2 provided the meteorological satellite service is not imposed or constrained from the MSS signal. A new primary MSS allocation is the band 1626.5 to 1631.5 MHz was also made for regions 2 and 3.

"The significant amount of spectrum allocated to Region 2 for MSS also indicates a world understanding that the U.S. has the greatest demand for MSS technologies," said Brian Pemberton, president of the American Mobile Satellite Corp. AMSC plans to begin offering voice and data service in North America later this year on an interim Inmarsat system, until it launches its initial MSAT satellite in 1994.

Meanwhile, Inmarsat applied to the International Frequency Registration Board (IFRB) to provide mobile service (in the 1616-1626.5 MHz and 2483.5-2500 MHz and 2170-2200 MHz and 980-2010 MHz) for both geostationary and LEO applications.

The Motorola Iridium project calling for 77 LEOs for worldwide voice and positioning also is moving ahead quickly thanks to the favorable allocations for the large LEOs. Iridium chairman Robert Kinzie signaled his desire to offer Iridium access to Inmarsat in the future. "We want them to offer our product to their customers," Kinzie said. "They have the store that serves the market," Kinzie continued, "we want them to give us the shelf space and sell our product."

"While all the LEO proponents were satisfied with the conference

results," delegation member Leslie Taylor, points to some potential problems. "The need to coordinate with the Russian global positioning could impinge somewhat on Motorola's plans, as Motorola proposes to use only the 1.6 GHz spectrum where the Russian system operates," Taylor adds.

"By way of contrast, the other proposed LEO systems, including those of Loral/Qualcomm and TRW," Taylor notes, "obtained a primary allocation for the downlink and, because of their use of Code Division Multiple Access (CDMA), can readily coordinate, not only with each other, but with the Russian system."

## HDTV and GSS

A significant issue regarding the higher 20-plus GHz range was the potential for rain fade, a condition that is particularly prevalent in areas of heavy precipitation. The negotiations for HDTV were impacted by this problem, and to a lesser degree the failed attempt to assign a general satellite service (GSS) in the 30/20 GHz bands.

High Definition Television (HDTV) allocations for two regions were made to be effective after April, 2007. Furthermore, each region mandated its own unique area, while the Americas opted for frequencies near the FCC band.

Region 1 (Europe and Africa) and Region 3 (Austral-Asia) therefore opted for band 21.4 to 22 GHz to become available as of April 1, 2007. Prior to this date, HDTV may be implemented provided existing services are protected. After that date, existing services will be authorized to operate in those bands provided they do not interfere with the BSS HDTV nor claim protection from it. In region two, (Americas) the band 17.3 to 17.8 GHz was also allocated as from April 1, 2007. The choice of these bands take into account the spectrum made available by the 1977 BSS plan (Regions 1 and 3) and the 1983 BASS plan (Region 2).

Feeder links for HDTV may be provided on a worldwide basis through a new allocation for the fixed satellite service (27.5 to 130 d

in region 3, the band 24.75 to 2525 GHz. In a resolution, the conference underlined the difficulties for countries for high-rain fall climatic zones because of the effect of rain on TV signals (phenomenon which increases as the frequency increases) and requested the CCIR to study the particular needs of high rainfall climatic zones for HDTV GHz), a number of additional options exist for providing feeder links to BSS HDTV, including in region 2 the band 18.1 to 18.4 GHz, and with a view to proposing technical methods which would be used to implement some type of HDTV in the 12 GHz band.

## Broadcast Satellite Sound

Broadcast Satellite Sound — Worldwide primary allocation was made available for the BSS in the 1452-1492 MHz band, for the exclusive use of digital audio broadcasting. BSS (sound) systems would provide CD-quality digital audio radio directly from satellites to cars.

A Resolution was adopted at the WARC which stated that a conference should be held, preferably before 1998, for the planning of BSS (sound) and the development of procedures for coordinating the use of complimentary terrestrial broadcasting. The conference would include a discussion of VHF terrestrial DAB for Region 1 and interested countries in Region 3 (most of Asia, Australia, and the Pacific islands).

It was also requested that the European countries perform technical studies with respect to compatibility criteria between DAB in the VHF bands and safety services in the band. It was expected that DAB will be generally implemented within the FM Broadcast Plans.

Pending that conference, it was determined that BSS (sound) may preferably be introduced in the upper 25 MHz of the band on an interim basis, subject to the protection of existing services, both fixed and mobile. The complementary terrestrial broadcasting could then be introduced during this interim period subject to coordination with

the affected countries.

A significant number of delegations indicated, through footnotes, that they sought alternative allocations to provide BSS (sound) in either the 2310-2360 MHz band (the choice for the U.S.) or at 2535-2655 MHz. According to Ambassador Baran, "the conventional wisdom is that it will start terrestrially and that the satellite portion will be down the road a little bit." The future conference would also address improved use of the spectrum through new satellite antennas and receiver sensitivity.

In response to the allocation, David Margolese, vice-president of Satellite CD Radio, Inc., stated "we believe the opportunity to choose from 30 or more commercial-free, CD-quality channels in a wide variety of formats, all for just \$5-\$10 per month, will be irresistible to many motorists." He also said that even though there would not be a global allocation, growth would not be hindered due to the size of the U.S. market.

A spokesperson for the National Association of Broadcasters told *Satellite Communications* that they see the decision for the worldwide 1500 MHz allocation "as a threat to our system of local over-the-air terrestrial broadcasting. We expect the Canadian and Mexican governments and U.S. receiver manufacturers will put our government under tremendous pressure to adjust to the worldwide [BSS-sound] assignment in the 1500 MHz band by moving U.S. military telemetry operations from 1500 MHz to 2300 MHz. For the U.S. terrestrial broadcasting system to remain competitive, it is urgent now that all proponents of terrestrial DAB systems develop them quickly."

## Conclusion

In order to assist developing countries to take part in the new telecommunications revolution, the Conference adopted a resolution providing for all types of assistance, including financial. Unless otherwise indicated, the decisions approved at the WARC will enter into force on October 12, 1993. □

# Low-Earth Orbit Communications Satellites Compete for Investors and U. S. Approval

PHILIP J. KLASS/WASHINGTON

Several new communication satellite systems using nongeosynchronous orbits to provide global cellular telephone and high-speed data service are vying for Federal Communications Commission approval and investor-partners. FCC action is expected by early 1993.

The systems' use of low to medium-altitude orbits will open the way to low-power user handsets that would be only slightly larger and heavier than current cellular telephones. This raises the prospect that such systems could be used by business and private aircraft for air-ground communications.

However, the nongeosynchronous orbit requires multiple satellites, ranging from a dozen for one contender to nearly 80 for another. This requires an upfront investment ranging from several hundred million to several billion dollars before the system can be fully operational.

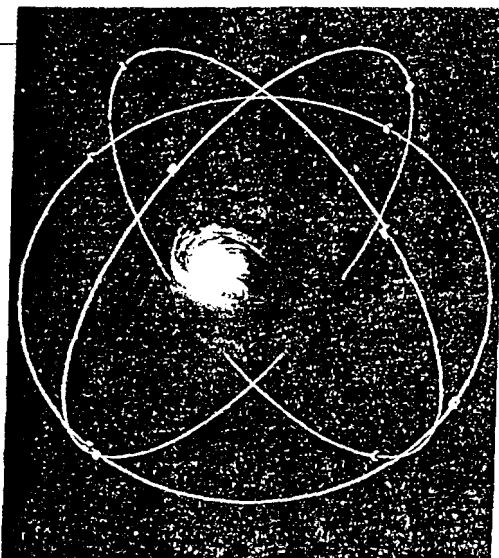
While a single geosynchronous-orbit satellite can provide coverage of a regional area, low-Earth orbit (LEO) systems are intrinsically global because they move relative to an Earth-based location. If such systems are to be economically viable, overseas partners are needed to utilize their full capabilities.

LEO-type systems "pose formidable problems of political and institutional togetherness," Rene C. Collette, the European Space Agency's director of telecommunications programs, said. Speaking at a recent American Institute of Aeronautics and Astronautics (AIAA) conference here, the ESA official said, "It seems to us that the Inmarsat institutional context would not be a bad place to start."

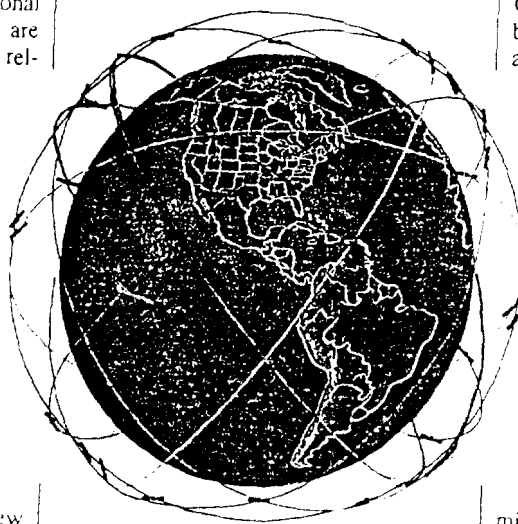
The frequency spectrum for this new type of communication satellite service was authorized at the recent WARC-92 (World Administrative Radio Conference) in Spain (AW&ST Mar. 9, p. 31). WARC-92 authorized spectrum at 1.6 GHz. (L-band) and 2.5 GHz. (S-band) for systems capable of providing both voice and high-speed data. These are called "Big LEOs" to distinguish them from "Little LEOs," which are intended to provide only low-speed data service. The conference authorized spectrum for Little LEOs in the very high frequency and ultra high frequency bands.

U. S. contenders in the Big LEO field include

■ Iridium system, proposed by Motorola



Contenders among satellite systems for providing cellular telephone service include TRW's Odyssey (top), using 12 satellites in 6,400-mile-high orbits; and Loral/Qualcomm's Globalstar, using 48 satellites in 750-mile orbits.



would use 77 satellites in 500-mi-high circular polar orbits (AW&ST June 3, 1991, p. 80). Lockheed Missiles and Space Corp. is Motorola's teammate for spacecraft design.

■ Globalstar—a system proposed by a joint venture of Loral Corp. and Qualcomm, Inc.—would require 24 satellites in 750-mi. circular orbits with an inclination of approximately 50 deg. for coverage of the continental U. S. or 48 spacecraft for global service.

■ Odyssey system, proposed by TRW, would use 12 satellites in 6,400-mi. medium-Earth orbit (MEO) with 55 deg. inclination.

■ Ellipso system, proposed by Ellipsat Corp., would use satellites in highly elliptical orbits (HEO), pioneered in the mid-1960s by the then-USSR's Molniya communication satellites. A constellation of 12 satellites could provide initial coverage of the Northern Hemisphere, and another 12 would be needed for Southern Hemisphere service. Satellites would have an apogee of approximately 1,800 mi., a perigee of 265 mi. and an orbital inclination of 63.4 deg.

■ Arnes, proposed by Constellation Communications, Inc., would use 48 satellites in polar orbits at an altitude of approximately 635 mi. The satellites would be distributed in four orbital planes.

Each applicant seeking FCC approval for a Big LEO system is required to estimate the cost of deployment and first-year operation. TRW submitted an estimate of \$1.3 billion. The Loral/Qualcomm estimates for an initial 24-satellite Globalstar system with eight spares in orbit are \$657 million and \$829 million for a 48-satellite system.

Motorola initially estimated the cost of deploying a 77-satellite Iridium system at \$2.3 billion. But that figure has risen to \$3.2 billion, which includes initial operating costs, according to Iridium, Inc. President Jerrold D. Adams. Speaking at the recent AIAA conference, Adams said the system is expected to become profitable when it has 800,000 users, which is expected to occur in two or three years. Current estimated user cost is \$3/min., compared to about 50 cents/min. for a cellular telephone, he said.

Adams showed a mockup of a new mini-Iridium handset, comparable in size to a current mini-cellular telephone, which he said could be used for both types of service. He said it would provide 2 hr. of "talk-time" before the battery needs recharging. If FCC approval is granted, Adams said, all 77 Iridium satellites could be in orbit by 1996 by launching six or seven spacecraft per vehicle.

Most of the Big LEO systems are envisioned as vehicles for extending cellular telephone service beyond existing high-population areas. Their proponents believe that with a global market to help underwrite satellite system cost, their approach can be more cost-effective than that of cellular operators building more terrestrial facilities to cover low-population areas. The

LEOs also could be used in countries that lack a modern telephone system.

With the exception of Motorola's Iridium, the satellites proposed for all of the Big LEO systems would function as simple repeater-relay ("bent-pipe") stations. They would link a mobile user with a gateway Earth terminal that would connect into a public telephone system to reach the intended recipient. A user handset would transmit to the satellite at L-band and receive at S-band. Communications between satellite and gateway stations would be at C-band (5-6 GHz.) or Ka-band (30 GHz.).

One major difference between Iridium and other proposed Big LEO systems is that its user handsets would receive as well as transmit in L-band. Another is that Iridium satellites would function as switching stations to relay a call via adjacent satellites to a gateway station nearest the party being called. This makes Iridium a potential competitor to existing cellular telephone systems because, in transmitting a call, it would bypass en route public telephone service providers except when actually connecting with the number being called.

The L-band frequencies recently approved for handset uplink had been allocated by earlier WARC's to provide mobile users with their geographic locations—called radio determination satellite service (RDSS). This would be accomplished by measuring the transit times for a user signal to be relayed to an Earth station via two or more different satellites.

Most of the proposed Big LEO systems plan to include the RDSS function to determine location of each user so revenue can be shared with the appropriate gateway terminal owner. The Iridium system, however, plans to determine user location by means of a small Global Positioning System receiver in each handset.

#### COMPETITION FOR AMSC

All of the proposed Big LEO systems are potential competitors for the American Mobile Satellite Corp. (AMSC), the consortium selected earlier by the FCC to be the sole provider of voice and high-speed data communications for all U.S. mobile users, including aircraft. Because first-generation AMSC satellites and those of its Canadian partner—Telesat Mobile, Inc. (TMI)—will be deployed in geosynchronous orbit, larger and more-powerful user terminals will be required.

However, the two companies will consider LEO-type systems for their second-generation systems. TMI President Michael Zuliani reported at the AIAA conference. The first two AMSC-TMI satellites, which are being built by Hughes, are scheduled for launch in the spring and fall of 1994, Zuliani said.

One hard-to-quantify advantage of LEO systems for voice communications is

their substantially reduced time delay compared to the roughly 1/4-sec. one-way signal transit time for geosynchronous satellites at an altitude of 22,300 mi. TRW believes its medium-altitude system is an optimized compromise with Odyssey's orbital altitude of 6,400 mi., which cuts the number of spacecraft needed for global coverage to only 12.

Following recent ESA trade-off studies of different LEO system concepts, the agency concluded that a medium-altitude system similar to TRW's Odyssey was "the most attractive," Collette told the AIAA conference.

Three of the proposed systems—Globalstar, Odyssey and Ellipso—will use a relatively new spread-spectrum modulation technique called code-division multiple access (CDMA). Developed for secure military communications, CDMA is one of

*Most proposed Big LEO systems would include the RDSS function to determine the location of each user*

two techniques that cellular telephone operators are considering for use when they convert from analog to digital technology. The other is time-division multiple-access (TDMA), which Iridium will use.

The Aries system will use frequency division multiple access for the uplink from handset users. The downlink to user handset will use TDMA, which also will be employed for communications between satellite and gateway terminal.

Geosynchronous orbit systems typically employ two satellites that provide redundant area coverage to assure reliable, continuously available service. Proposed Big LEO systems depend upon novel orbital constellations to minimize the number of satellites needed to ensure that a user handset always will have two or more satellites within view.

The roughly 50-deg. orbital inclination selected for Globalstar is designed to provide continuous coverage at latitudes up to about 69 deg., with slightly degraded service at higher latitudes. The precise inclination used will depend upon whether the initial deployment includes 48 satellites, or 24 satellites plus eight spares with subsequent expansion to 48 spacecraft. A Globalstar mobile user would "see" one satellite rising in the southwest and move northeast, while the next would rise in the northwest and head southeast, after which the cycle would repeat.

Each Globalstar spacecraft will have six antennas, each designed to generate a large "banana-shaped beam. The six beams collectively will cover an area the

size of the continental U.S.," Anthony J. Navarra, vice president for business development at Loral Aerospace, said. The long dimension of the banana-shaped beam is oriented in the direction of satellite movement so a mobile user normally remains within coverage of a single beam during the 10-12 min. the satellite is in view. With a 24-satellite constellation, a mobile user normally will have at least two satellites in view at all times, or three satellites with a 48-spacecraft constellation. Each satellite's estimated weight at launch would be less than 600 lb.

#### THREE RECEIVERS PER TERMINAL

A novel technique will be used to determine which of the several satellites within view should be used by a gateway station for the best communications link with each mobile user. Each mobile user terminal will have three receivers that continuously will monitor the quality of signal from different satellites within view.

Periodically, the gateway station will transmit a pilot tone via the satellites, which the user-terminal's three receivers will get and transmit back to the gateway via each satellite in view, according to Navarra. This will enable the gateway station to determine which satellite is closest to each user and whether its line-of-sight to the satellite is blocked momentarily by a tall building or other topographic obstacle.

The medium-altitude Odyssey constellation would deploy its 12 satellites—each with a 6-hr. orbital period—in three orbital planes with 55-deg. inclinations. Because of their higher altitude, each Odyssey satellite would remain in view of a mobile user for about 2 hr., minimizing the need to transfer to another satellite. The higher orbital altitude also would provide high-latitude coverage and enable two gateway terminals to serve an area the size of the continental U.S.

To achieve maximum capacity for highly populated areas, the Odyssey satellites will be reoriented to point their multibeam antennas toward such regions during high-demand periods.

Despite the higher altitude of Odyssey satellites, TRW calculates that user-handsets will need to radiate only 0.5 w. average power—an important factor affecting handset size and frequency of battery recharge. TRW estimates the satellite will weigh approximately 2,500 lb. at launch, according to Odyssey program manager Roger J. Rusch.

Because of the economic need for international partners to exploit the global capabilities of LEO-type systems fully, some observers believe Globalstar may have one potential advantage. The reason is three internationally influential European companies—Aerospatiale, Alcatel and Alenia Spazio—jointly hold 49% ownership in Space Systems/Loral, which would build the spacecraft. □

HDTV equipment and on whether Commission should review overall 15-year HDTV conversion schedule in 1998 as way to alleviate concerns about premature termination of NTSC. Comments are due July 17, replies Aug. 17.

Nine years is long enough for HDTV to establish itself, FCC said, and 100% simulcasting will serve twin goals of protecting consumer investment in NTSC sets and ensuring spectrum efficiency. Commission also seeks comment on plan that would give broadcasters complete flexibility on simulcasting in first 2 years after broadcasts begin (within 5 years after standard is set) and 50% simulcasting between years 7 and 9.

Fifteen-year total conversion to HDTV should be enough to allow owners of NTSC sets bought before HDTV standard is set "full use of their NTSC equipment," FCC said, in part because inexpensive HDTV-to-NTSC down-converters are expected to be available then. Commission said it's especially interested in hearing from manufacturers and others on likely availability and cost of HDTV equipment. Review of HDTV conversion deadline in 1998 "would leave room for adjustment if the advanced TV implementation should proceed more or less swiftly than we envision," order said.

Negotiations among broadcasters on channel assignments "should be an integral part of the advanced TV assignment process," FCC said, because it would "ensure the most expeditious and efficient implementation" of HDTV. Under proposed plan, broadcasters would have fixed period to negotiate channel assignments in each broadcast area, with Commission to resolve any disputes on first-come, first-served basis. Both commercial and noncommercial stations would participate in negotiations, and FCC predicted that varying needs of different stations would ease negotiations -- one station might favor channel that's close in frequency to NTSC channel, for example, while another wants widest possible coverage area.

## Wave of Future Seen

### **BIG AEROSPACE PLAYERS INTERESTED IN SMALL SATELLITES**

Surprise at 2nd annual New World of Small Satellites conference in Washington last week was presence of representatives of big aerospace companies such as McDonnell Douglas and Martin Marietta that aren't usually associated with small satellites. "The future is small satellites, that's why we're here," McDonnell Douglas official said. "The U.S. government also has expressed more interest in small satellites serving communications needs for defense and other reasons. We're a government contractor and we try to stay tuned to what government wants." Attendance at conference was 200, twice number present last year, said conference co-chair Jill Stern, communications attorney. She said recent WARC spectrum allocations for low-Earth-orbit (LEO) services clearly had spurred interest in small satellites.

Officially and unofficially, representatives of rival proposed LEO services disclosed at conference that they're meeting with PTIs and private communications companies throughout world to convince them to become part of their LEO networks. Alan Parker, pres. of Orbital Sciences Corp. (Orbcomm), said company already has reached preliminary agreement with 11 countries in Central and S. America to be part of its LEO network and hopes to reach accords with another 11 countries by end of year. He said each country must agree to invest several million dollars to build its own gateway and satellite communications control center. Representatives of other LEO companies told us they have reached similar agreements. "It's a game of survival," said one. "Whoever gets the most countries signed up has the best chance of getting financing on Wall Street."

LEO companies have been mum on financing for most part. But at conference, Davinder Sethi, dir. of Information Technology Group for Barclay's Bank, disclosed that Barclay's had agreed to be investment bank for Ellipsat, proposed big LEO venture. He said Ellipsat's proposed global portable \$250-million communications system is much less costly than Motorola's Iridium \$3.5-billion program. Sethi said Ellipsat seemed to his bank to be most realistic in cost.

FCC Chmn. Sikes, in luncheon address, said he feels market exists for small satellite-based communications networks. He said more than half-billion people in Africa, half-billion in former Soviet empire, 2 billion in Asia and Pacific Islands and another 432 million in Latin America currently lack good communications. "True, income levels in many, if not most, of these unserved areas tend to be low," Sikes said. "Don't forget, however, that one of America's largest 20th century fortunes -- Sam Walton of WalMart -- was built on providing retail services in rural America, a part of our country where income levels also tend to be lower."

Sikes said that while absolute cost of satellite systems may be high, on per-user basis they may be quite inexpensive even at relatively modest loading levels. "For example, conventional phone service entails \$1,400 to \$2,000 per



subscriber in capital investment," he said. "Cellular carriers currently have about \$1,000 per subscriber invested. Cable operators have about \$700, on average, even less in some cases. Well, a \$100-million satellite system with 100,000 subscribers would involve that same \$1,000-per-subscriber investment. Even Motorola's ambitious Iridium proposal is suggested to involve the same \$1,000 per subscriber at a base of only 700,000 subscribers worldwide. If these systems can achieve greater penetration, the investment per subscriber would drop."

Sikes said close look at numbers shows portable satellite communications networks are very viable: "In short, if you run even the back-of-the envelope numbers, I think you will see that small satellite services have quite significant revenue -- and service potential."

## COMMUNICATIONS PERSONALS

**Charla Rath**, telecommunications policy specialist, NTIA, named FCC Chmn. Sikes' telecommunications adviser, succeeding Cheryl Tritt, now chief, Common Carrier Bureau... **Jack Ottaway**, ex-Hughes Aircraft, appointed exec. vp-COO and a dir., Showscan, succeeding **Peter Beale**, resigned... **Claude Marx**, ex-political reporter, *Ark. Democrat*, joins Sen. Burns (R-Mont.) office as Poynter Fellow... Promotions at Audiovox: **Mark Woolery** to vp-sales, Carolina region; **Louella Carroll** to vp, OEM/AG Div... **Kent Foster**, pres., GTE Telephone Operations, elected a dir., GTE... FCC Calendar -- May 11: Chmn. Sikes addresses International Mobile Communications conference, London, via satellite from Chicago, 8:30 a.m. He's keynote speaker at SS-7 Summit Meeting, Swiss Grand Hotel, Chicago, noon.

## TELEPHONY

House Judiciary Committee won first round in what's expected to be major jurisdictional battle on MFJ legislation with House Commerce Committee. Parliamentarian referred new bill (HR-5096) solely to Judiciary Committee, despite effort Thurs. by Commerce to get crack at bill, we're told. Judiciary Committee staff was reported elated by decision, in which parliamentarian held that bill addressed industry-specific antitrust matter. Decision is blow to Commerce Committee, which has several MFJ-regulatory bills bottled up and fears Judiciary will get jump on issue, we're told. Early indications are that Judiciary will move to markup this month. Commerce's bills, while disappointment to RHCs, aren't seen by industry as regressive as Judiciary's, industry sources said. Door still is open to Commerce to seek sequential referral of HR-5096 when Judiciary has completed its work if enough changes have been made to allow Commerce to make germaneness case. However, no decisions have been made, Committee sources said. Meanwhile, reaction continued to pour in on new proposal, which USTA called "a travesty. It would severely retard the modernization of our nation's telecommunications infrastructure." Gerald Blatherwick, Southwestern Bell vice chmn., said bill "doesn't make sense... This bill is not about protecting consumers or workers, it's about protecting entrenched business interests." Advocates for disabled said in May 7 letter to author, Judiciary Committee Chmn. Brooks (D-Tex.): "You continue to misunderstand our needs and the solutions necessary to have our needs met through a fully functional, enhanced public switched telephone network." Citing access requirements of Americans With Disabilities Act, groups said: "Your bill rolls back the authority of telephone companies to build accessibility into the public networks and the products they produce. Instead, it sets up a system of waivers and exceptions. Such an approach has never worked. What is needed is the integration of capabilities and accessibility into the products and services as they are deployed." Letter was signed by representatives of National Network of Learning Disabled Adults, Telecommunication for Deaf Inc., World Institute on Disability.

Final Senate action on Caller ID bill (S-652) appeared remote at weekend after senators turned to other legislation and promptly became mired in another partisan dispute. Bill isn't even among measures scheduled for floor consideration when Senate reconvenes Tues., leadership offices said. S-652 is snagged on election-year dispute over crime reforms (CD May 8 p7, May 7 p1). BellSouth spokesman clarified that RHC opposes House and Senate Caller ID bills and considers Senate's "worse than" House's HR-1305, which doesn't contain language to preempt state regulations with federal standard. S-652 was endorsed Thurs. in floor speech by Sen. Adams (D-Wash.), who raised usual privacy issues on provision of Caller ID without some blocking option, despite service's other "merits".

Telecommunications users urged House Judiciary Committee Chmn. Brooks (D-Tex.) last week to consider impact that FBI digital wiretap proposal could have on businesses. Groups, including hardware and software manufacturers, network and database users and providers, and privacy advocates, said they strongly opposed proposal as threat to their computer security and privacy. "Any system that is purposely designed to be open to FBI surveillance is vulnerable to other types of intrusions as well," they said in joining chorus raising fears about economic espionage (CD May 8 p4, May 4 p4). Groups said that any legislation in area would be premature, that "requiring that our com-

# Mobile Satellite News®

The Executive Report on MSS Voice and Data Systems

April 1992  
Washington, D.C. ^  
Vol. 4, No. 4

Dear Executive:

## TRW PROTESTS MOTOROLA'S REQUEST FOR EXPERIMENTAL LICENSE

While all the proposed low-earth-orbit (LEO) ventures above 1 GHz await the verdict of a Pioneer's Preference decision, two have waged a paper war over the award of an experimental license. Indeed, the much talked about Iridium proposal requested an experimental license that TRW Inc., a competing firm, calls a \$1.3 billion "thinly veiled attempt to circumvent licensing requirements."

Although three LEO companies, Ellipsat Corp., Constellation Communications Inc. (CCI) and Iridium Inc., have filed with the FCC to obtain an experimental license, only Iridium's application received a Petition to Deny by TRW Inc.

At our deadline, Frank Wright, chief of the FCC Frequency Liaison Branch, told MOBILE SATELLITE NEWS that all three experimental applicants will be "treated as a package," but no decision to date has been made. In other words, the FCC will either license all three applications at the same time or none of three. CCI and Ellipsat's experiments do not entail in-orbit testing; only Motorola proposes to launch satellites for in-orbit research. More than likely, a source told us, all three will be granted.

**Inside**

pp. 4-7

**Exclusive, On-Site Coverage  
from WARC**

TRW, in its filing, said it specifically opposes phase four of Motorola's proposed experiment to build seven, fully functional Iridium satellites, constituting one-eleventh of its 77-satellite system, on the same schedule proposed in its full-service application.

"Because there is no rational experimental necessity for seven satellites and because Motorola's request would have a significant prejudicial impact on the various pending commission rulemaking and licensing proceedings concerning [the applicants requesting] to operate in the 1610-1626.5 MHz band, Motorola must not be permitted to implement phase four," said TRW.

Furthermore, TRW claims that the seven satellites, identical to the actual Iridium spacecraft, "appear intended to become the first orbital plan of the full-service system."

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# BUSINESS

April 92

## International Group Backs Global Satellite Phone Plan

*U.S. Firms Could Be Top Suppliers of New Technology*

By John Burgess  
Washington Post Staff Writer

Representatives of 124 countries yesterday cleared the way for a new multibillion-dollar communications system that would use dozens of low-orbiting satellites to relay calls to and from people carrying pocket-sized phones anywhere on Earth.

Under the proposed system, which could start working by the mid-1990s, a person standing in a field in Kansas could call someone in a Mongolian tent using a phone network that would be based entirely in space. The call would go directly to an overhead satellite that would route it to another satellite and then on to the correct phone thousands of miles away.

Yesterday's action, which set aside a portion of the world's increasingly crowded radio spectrum for the new system, was taken at the end of a month-long meeting in Spain of the International Telecommunications Union (ITU), a Unit-

ed Nations affiliate. The agreement removed a major hurdle for the plan, but it still faces financial, technological and regulatory obstacles, as well as commercial uncertainties resulting from competition from existing ground-based cellular phones.

The U.S. government pushed hard for spectrum space for the satellite system at the meeting, in part because putting the system in orbit would bring major orders to U.S. high-technology companies—all five of the leading contenders to deploy this new technology are U.S.-based.

"These decisions will be good news to our . . . manufacturers or our U.S. service providers," said Jan Baran, chief of the 70-member U.S. delegation.

The U.S. representatives prevailed against opposition from Europe with help from many developing countries in Africa and South America. The developing nations view the system as a low-cost way of providing phone communications to remote villages. The European countries, which have already built ground-based cellular systems that cover most places on the continent, were initially reluctant to reassign spectrum space but were finally persuaded to go along.

"We can now move forward as we'd planned," said Robert W. Kinzie, chairman of Iridium Inc., a D.C.-based subsidiary of Motorola Inc., which has proposed a \$3.5 billion system using 77 satellites circling the earth in low orbit. Plans call for it to become fully operational in 1997.

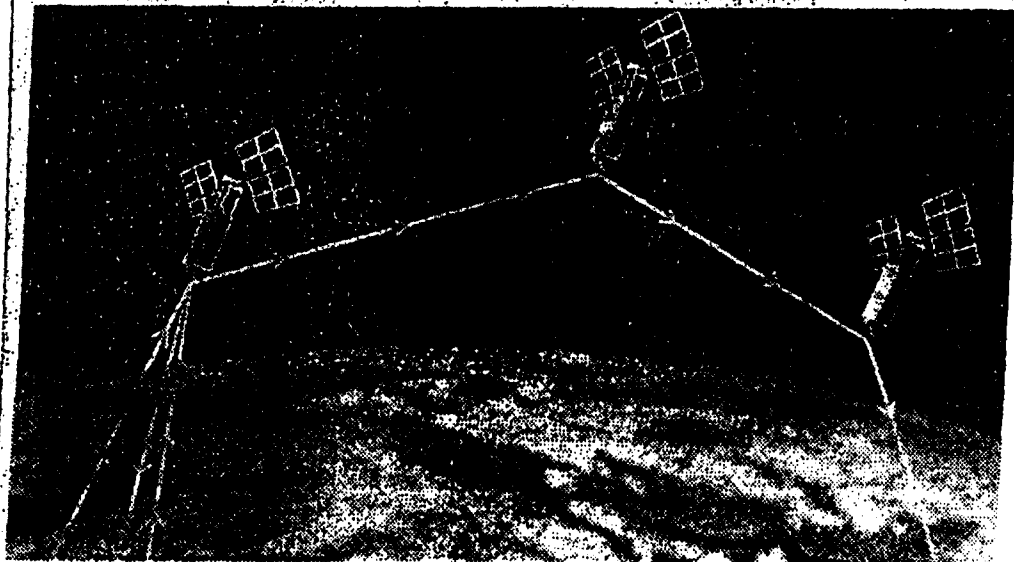
Sherrie Marshall, a member of the Federal Communications Commission, said her agency would now move quickly to grant licenses for the systems.

The U.S. companies proposing to lead deployment of the new technology include Motorola, Loral Corp. and TRW Inc., and two small companies, Constellation Communications Inc. of Herndon and Ellipsat of Washington. Baran said

See PHONES, B2, Col. 4



Pocket-sized phone made by a Motorola subsidiary could make use of the new system.



Under the plan, dozens of low-orbit satellites would route calls around the world.

# Global Satellite Phone Plan Advances

PHONES, From B1

the United States hoped that more than one system would be launched, to provide competition.

U.S. companies would not get all the work, however. Motorola, for instance, has already recruited European companies and a Canadian firm as partners, in addition to U.S. companies that have joined its team. It plans to license rights to build the telephone handset to as many companies as possible. Three European aerospace companies own 49 percent of Loral's space division.

Most communications satellites orbit at 22,300 miles, and telephone units on the ground must be large and heavy to have enough power to send signals to them. Ground-based computers route the calls.

Motorola's system would place 77 satellites in orbits so that one would always be passing over any point on the globe. Due to the satellites' low altitude, phones could be small. Satellites would receive a call from the ground, route it from satellite to satellite, and then drop it down to earth, either to another pocket phone or a conventional desktop phone.

"You can take the telephone out of your pocket and call any other telephone in the world," said Bill Pritchard, head of W.L. Pritchard & Co., a Bethesda-based engineering consulting firm. "That's quite a concept."

Motorola, which was the first company to float such a plan, says its service would cost about \$3 a minute, with the price of the phones starting at about \$3,000 but coming down. It would not replace conventional cellular service, which is cheaper, but would be used in areas where cellular service—which requires users to be near ground-based relay stations—is not available.

The ITU's convocation, known as the World Administrative Radio Conference, is held because radio signals do not respect national borders. If countries did not coordinate their use of the radio spectrum, signals from one nation would block out signals from its neighbors.

The talks are never easy because so many countries attend and because of the billions of dollars in sales that can rest on access to radio waves. In addition, countries jealously safeguard military and government frequencies,

which they see as crucial to national security.

Other high points of the conference:

- Frequencies were set aside for the broadcast of music and other audio programs directly from space to home radio receivers. The United States, however, has said it will not use the designated frequencies for this service because here they already are used by aerospace companies for air-to-ground transmissions of data during flight testing.

In addition, the powerful National Association of Broadcasters, which represents ground-based radio stations, has opposed any introduction of satellite radio, saying its coast-to-coast reach would undo the U.S. tradition of radio broadcasters having ties to their local communities.

- Additional spectrum space was granted for shortwave radio broadcasting.

- Delegates failed to agree on a single allocation for satellite broadcasts of high-definition television. They agreed to continue with the current system, in which different regions of the world assign different frequencies for these broadcasts.

# WASHINGTON TECHNOLOGY

The Business Newspaper of Technology

## Crowd Forms To Offer LEO Calls, Paging

*ORBCOMM, Iridium Gain  
After WARC Spectrum Award*

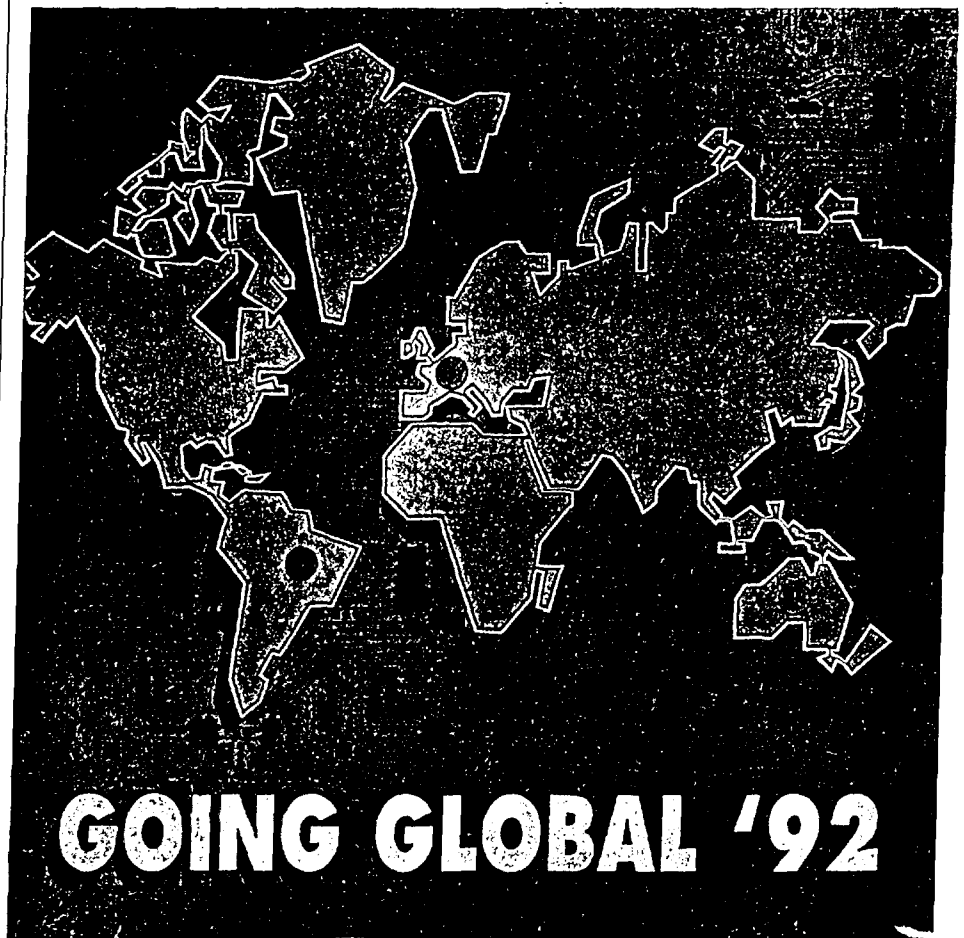
By Alan Pittman  
STAFF WRITER

Subsidiaries of Orbital Sciences Corp. and Motorola led a host of area satellite phone and pager companies standing ready with multi-billion dollar plans for pocket-to-pocket global communications after an international conference opened room on crowded airwaves for the new technology.

The recent World Administrative Radio Conference (WARC) allocation will enable low earth orbit (LEO) satellites to transfer calls to pocket phones or pagers worldwide within a decade—meaning “anyone anywhere anytime can call or be called,” said Iridium Chairman Bob Kinzie.

Iridium, a subsidiary of Motorola, plans a \$3.5-billion, 77-LEO constellation by 1997 to provide phone service and global positioning data for \$3 per minute worldwide. Other companies planning global

*continued on page 10*



# Crowd Forms in LEO

*continued from page 1*

phone systems include Loral Qualcomm of Arlington, Va., Constellation Communications in Herndon, Va., Ellipsat of D.C. and TRW in California.

Orbital Communications Co. (ORBCOMM), a subsidiary of Orbital Sciences Corp of Fairfax, Va., plans to provide global two-way paging and positioning priced at under 50 cents for a 200-character message transmitted via a \$80-100 million constellation of 26 LEOs by 1993. Starsys in Lanham, Md. and D.C.-based Leosat are other companies planning global pagers.

To secure spectrum for the LEOs and set free a multi-billion-dollar satellite communications industry, the U.S. sent a 70-member delegation to Spain to negotiate with the 124 countries at WARC, ended March 3.

ORBCOMM President Alan Parker called the allocation "a hands-down victory," but Iridium hoped to do better.

Except Iridium, all the other companies have proposed systems using technology which would allow them to share the airwaves with other users if necessary. Countries opposed to systems which could wash out their signals imposed a secondary allocation on Iridium, meaning Iridium transmissions must yield to existing users.

Kinzie said his engineers can build around the problem and emphasized Motorola's need for investors to loft the

communications system.

But Leslie Taylor, a telecommunications consultant and WARC attendee, said "the need to coordinate with the Russian global positioning system could impinge somewhat on Motorola's plans."

And while the favorable allocation clears the first hurdle, the companies still must secure licenses with the Federal Communications Commission and indi-

vidual nations worldwide. But most countries are expected to quickly follow the international agreement.

The FCC, for example, proposed opening 220 megahertz to the new communications technologies Jan. 16 in preparation for the

WARC. The commission has said it will expedite the regulatory process and may grant licenses as early as August.

While some hope that the spirit of cooperation towards a common goal will last after the companies returned this month from Spain, fierce competition appears more likely.

"We welcome the natural competition that will flow from this allocation," said Iridium President Jerrold Adams. Iridium hopes to have 100 million subscribers worldwide by 2000 to pay for its expensive satellite constellation.

Iridium has already proposed a cooperative marketing deal with arch-rival Inmarsat, the international maritime communications cartel that has proposed its own satellite phone system.

— • —  
**The allocation  
was a hands-  
down victory for  
ORBCOMM.**  
— • —

# Pentagon Hopes To Piggyback On New Satellite Phone System

The Pentagon launched a comprehensive effort last week to study the military applications of a new breed of multi-billion dollar, globe-straddling satellite telephone systems that can beam calls from one palm-sized phone to another, according to Pentagon and industry sources.

The effort is expected to usher in a new era where the Pentagon piggybacks on commercial phones to fight its battles instead of using only costly, military-unique systems.

Assistant Secretary of Defense for C3I Duane Andrews, who is heading the initiative, issued a request for proposals last week through the Defense Information Systems Agency seeking industry analysis of potential Pentagon use of commercial systems.

According to Andrews' RFP, the department "is planning to increasingly rely on commercial satellite communications systems for general purpose support of its forces throughout the world in order to permit the military satellite communications systems to be more narrowly focused on providing [C4I] support."

"A key objective...is to leverage the significant private sector investments made for a commercial market, and to determine how to most effectively use commercial resources without adversely affecting military requirements and national security," he added.

The move comes hard on the heels of a watershed meeting in Spain—also last week—that paved the way for the new systems. In a major victory for satellite phone-makers, the 124-nation, U.N.-affiliated International Telecommunications Union (ITU) assigned the embryonic satellite systems new space in the increasingly congested radio spectrum.

The new systems will use con-

BY ANDREW WEINSCHENK

stellations of low-orbiting satellites to pick up calls from the earth's surface and then relay them over other satellites to their destination.

Without the ITU spectrum allocation several proposed global satellite phone systems would have been dead in the water, according to industry sources.

Users of the new phones will have unparalleled flexibility to call from any point in the world to another without using a land line. An Army truck driver, for example, sitting in the unmarked deserts of Saudi Arabia could call a state-side depot officer walking around a parking lot for instructions on repairing a broken water pump.

While many warfighting needs would still be handled by military communications, administrative and logistics functions, or about 90 percent of a given force, could rely on the new phone system. The new phones also could "provide pre-planned surge capacity for crisis and low intensity conflict support," said the RFP.

The new phone systems also have sparked interest among joint staff officers pushing a broad effort to improve communications interoperability and establish a world-wide network that regional commanders could plug into at a moment's notice. Dubbed "Command, Control, Communications, Computers and Intelligence (C4I) for the Warfighter," it was launched in October by Vice Adm. Richard Macke, the Joint Staff director for C4.

Macke briefed Defense Secretary Dick Cheney and Joint Chief of Staff Gen. Colin Powell on the concept Feb. 6. According to one Pentagon source, the briefing was "very well received."

The biggest selling point of commercial systems is affordability, "Commercial industry

would foot the bill for R&D. And we would become users on a pay-as-you-go basis," said one Pentagon source. Military-only systems require huge Pentagon investments in R&D and are costly to run because of the limited number of users.

"It's time we stopped trying to be the owner of a world-wide system," said Col. David Bryan, of Macke's staff at December special operations conference. "We no longer need to do that."

Another key benefit to the new satellite phones is interoperability. The Pentagon has struggled for years to blend its complex network of diverse communications gear into a single, easy-to-use system.

Ironically, problems with interoperability during the Grenada invasion sprouted a popular, apocryphal tale about an Army officer who ordered an air strike by phoning the Pentagon with a calling card.

But commercial phones that became a stark symbol of problems have now become a ray of hope.

"Interoperability is a key attraction," said one Pentagon source. "This is world-wide, instant communication."

The new phones also would help reduce the communications logistics burden. "Ultimately, the benefit would be a greatly reduced size and quantity of communications gear" that was shipped to a theater, said one Pentagon source. While gulf war communications proved solid, "we had plenty of time to set up the system," he said. Future contingencies may not afford that luxury.

Commercial vendors who have been eyeing a globe-straddling system for years have already begun jockeying for a share of the new market. Iridium Inc., a subsidiary of Motorola Inc., is proposing to build a \$3.5 billion, 77-satellite system expected to become fully operational in 1997. TRW Inc. is proposing a 12-satellite constellation dubbed "Odyssey" for \$1.3 billion.

Loral Corp., Ellipsat Corp. and Constellation Communications Inc. are all pushing alternative concepts.

# Mobile industry lands on top of Commerce forecast report

WASHINGTON—Mobile communications businesses top the list of the telecommunications industry's fastest-growing sectors for 1992, according to a U.S. Department of Commerce report that predicts moderate growth for most U.S. industries this year.

The 628-page study, called the "1992 U.S. Industrial Outlook," provides growth projections for 350 U.S. industries and is written by more than 100 industry specialists.

According to the report, mobile satellite services will be the most dynamic and innovative sector of the satellite service industry, with 1992 revenues of more than \$150 million—up from \$85 million in 1991.

The report added that optimism regarding new mobile satellite services remains high, especially in the areas of satellite-delivered cellular telephony, digital radio and in-flight telecommunications via radio.

Interest in satellite applications was heightened last year as a result of the Persian Gulf conflict, the study said, and annual revenues from fixed and mobile satellite services rose to \$1.2 billion in 1991 from \$800 million in 1990. Total industry revenues are expected to reach about \$1.5 billion by 1992, it added. Likewise, the market for satellite ground equipment is expected to climb from \$1.3 billion in 1991 to \$1.7 billion in 1992.

Leading factors affecting cellular market growth this year were said to be nationwide roaming through further development of intersystem handoffs and clearinghouses, commercial availability of dual-mode equipment and full industry agreement on a uniform digital cellular standard.

1992 cellular service revenues are predicted to surpass \$9.4 billion, an increase of almost 30 percent over 1991. Those numbers will increase greatly once digital equipment is installed and begins providing higher system capacity in major U.S. markets, the report noted.

through experimental licenses from the Federal Communications Commission. The agency last October adopted a policy statement on PCS, noting that part of the spectrum for the new services should come from the 1.8-2.2 GHz band.

The Commerce Department predicted a continuing trend in new policy developments for 1992, such as the move toward allowing the regional Bell operating companies more regulatory freedom. Such action is expected to have an important long-term impact on the structure of the U.S. telecommunications industry, including information services, which the report said will grow at rates above those of the national economy this year.

However, the study noted, the July 1991 ruling by U.S. District Court Judge Harold Greene to let RBOCs provide information services has added a substantial dimension of uncertainty to all market planning within that sector. The ruling, now under appeal, has been the target of opposition from firms that believe it will let the RBOCs unfairly compete through cross-subsidization and monopolies over local telephone networks.

Organizations backing Greene's decision say the RBOCs can be important in developing a mass market for consumer information services.

The Commerce Department report has been published yearly since 1959.

Cellular equipment sales should increase about 25 percent to \$3.5 billion, it said, attributing growth, in part, to the introduction of dual-mode mobile units by major manufacturers.

Also, capital investment by cellular operators in their networks is anticipated to touch \$10 billion by the end of the year, a \$1.6 billion appreciation over 1991 figures.

The Commerce Department forecast that shipments by the radio communications and detection equipment industries will grow by about 5 percent this year, compared with predictions of stagnant sales of telephone and telegraph equipment.

The future of wireless personal communications services, or PCS, will be greatly determined by key decisions on technology, spectrum and licensing issues, the report noted.

Potential operators in the United States are evaluating the technical and economic feasibility of PCS

# Three Firms Line Up for Slices of the Spectrum

By Andrew Jenks  
STAFF WRITER

As telecommunications traffic rises, three Washington-area firms are among many turning to satellite-based systems to provide services—and joining the fierce battle over the increasingly crowded radio spectrum.

With applications pending before the FCC—the ultimate arbiter of the nation's radio waves—Ellipsat Corp, TV Answer and Orbital Communications Corp., a subsidiary of Orbital Sciences Corp. have proposed new wireless communication systems that will provide everything from nationwide paging services to video entertainment on demand.

The three companies, though competing for different slices of the spectrum, share one goal: the transformation of the radio waves into a cheap and widely available "interactive" communications medium.

They also share a common problem: "The spectrum is already so crowded," says Leslie Taylor, a telecommunications consultant specializing in wireless technologies. "Ultimately the fate of these systems will be determined by the extent that services can share spectrum."

## ORBITAL COMMUNICATIONS

Orbcomm, as the company is known, will spend \$300 million to construct and launch a constellation of 24 low-earth-orbit satellites. Services will include paging, messaging, position determination and remote vehicle location.

"Using one of our hand-held terminals you might send a two-line message to a telephone, PC or to another terminal," says Orbcomm spokesperson Laura Ayres. "A lost hiker might send a message, or an oil company in Alaska might use the system to monitor equipment."

The company has already signed agreements with Columbia, Venezuela, Canada and Panama and has "handshake" agreements with Brazil, Mexico and Japan. Matsushita will be building Orbcomm's first generation terminals. The company can begin service in mid-1993—assuming the unlikely prospect of a smooth FCC approval process.

Subscription fees will start at \$300 and terminals will range in price from \$50 to \$200. Each message sent will cost an additional 50 cents.

## ELLIPSAT

Ellipsat was the first company to apply for a low-earth-orbit satellite. Less ambitious than Motorola's worldwide "Iridium" satellite-based phone system, Ellipsat would initially provide coverage for the North American market. The system will cost about \$215 million to construct and use 24 satellites.

"We took the position that we could not build a new system with billions of dollars," says Dr. David Castiel, Ellipsat's chairman and CEO. "But we could build a minimum system that could tie into the existing cellular network."

Instead of providing direct service to

customers, Ellipsat will market to cellular companies, which in turn will resell the service. Cost: 40-50 cents per minute with terminals costing about \$900. Given FCC approval, "We could start building the system tomorrow," says Castiel. "We have proven technology, unlike many of our competitors."

## TV ANSWER

TV Answer has spent nearly \$25 million over the last five years in pursuit of FCC licensing for interactive video data service, or IVDS. The proposed system—which has been tested in the Reston area—allows viewers to control programming, order videos, shop and pay bills by pointing and clicking a handheld device at their television screens.

The resulting command travels via radio signal through a local groundstation and satellite link to TV Answer's Reston headquarters, where it is then relayed to participating television stations and retailers. The company plans to license its tech-

nology to firms operating in up to 8,000 "cell sites" currently planned by the FCC. Assuming FCC approval of the concept, service could begin as early as 1993, with monthly rental fees of as low as \$13 for the equipment.

All three companies have applied for the FCC's "Pioneer's Preference," which gives entrepreneurs and innovators of new technology preferential treatment in the FCC licensing process. "It gives the company that put the hard work into it a chance," says Sallie Olmsted, marketing manager at TV Answer.

Still, any applicant for FCC spectrum faces a lengthy and expensive legal battle. And for companies such as Orbital Communications, Ellipsat and TV Answer the challenge is as much legal and political as it is technical. Small entrepreneurial firms lack the resources to hire communications lawyers who can plead their positions before the FCC. And even if they could, they would still need to sustain themselves during the application process.

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TODAY'S ECONOMY IS ANOTHER REASON WHY GOVERNMENT



# Defense firms see satellites as next hot field

## *Loral, TRW move into market to offset drop in federal dollars*

By DOUG ABRAHMS

Two large defense contractors recently filed for applications to move into the communications field for cars and trucks to offset dwindling federal dollars caused by budget constraints and the easing of Cold War tensions.

"It's a hot market out there," said John Pemberton, a satellite analyst with the Gartner Group. "I've seen a lot of interest from the defense people. They're looking for something to do."

Loral Corp., which picked up Ford Aerospace this year, wants to launch and operate 24 satellites to provide voice and data services for mobile communications. TRW Inc. of Cleveland, which already builds satellites for the military, has proposed a 12-satellite system, and Defense Systems Inc. of Herndon, partially owned by TRW, wants to be part of another system with 48 satellites.

Each of the proposed systems will cost in the hundreds of millions of dollars. Herndon-based Constellation Communications Inc., which includes Defense Systems, estimated its system will cost under \$300 million, said Bruce Kraselsky, spokesman. The others declined to name a figure.

"Clearly the erosion of the military opportunities is impelling the firms to pursue other markets," said Wolfgang Demisch, an analyst at UBS Phillips & Drew in New York. "(Commercial satellites) is an area that defense companies can diversify into and maintain their technology base."

How profitable the business will be for some defense contractors is questionable because the stiff competition to win contracts will mean lower margins, he said.

The new crop of proposed systems will employ small satellites, a business that has grown in Northern Virginia.

"All the new hungry guys applied for (small) low-earth-orbit satellites," said David Castiel, president of Ellipsat Inc., which applied last year for a mobile satellite communications license. "It shows a lot of interest. It shows it is the next wave."

Until recently, government agencies and especially the military were the only real users of the birds weighing less than

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Each of the proposed systems will cost in the hundreds of millions of dollars.

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1,000 pounds. But a little over a year ago, Orbital Sciences Corp. filed an application with the Federal Communications Commission to provide a communications service to cars for emergency messaging using a small satellite system.

A few others followed, but the project that caught the defense contractors' eyes was Motorola's Iridium communication system, which would require more than 70 small satellites and cost more than \$2 billion. Defense contractors waged a heavy battle to become a part of the project, and Lockheed eventually won.

"They were banking very heavily on this Iridium thing," Pemberton said.

A window opened for other companies to enter the game when Geostar Corp., a Washington provider of satellite location and messaging services for trucks, liquidated this spring. Because space on the radio spectrum is so jammed, the FCC opened the space for other uses and received a number of proposals.

Enter Loral, TRW and possibly others.

"There are very few ways that the large aerospace companies can crack the small satellite market" because their overheads are too large and some don't have the expertise, said Stuart McCutchan, an editor at Defense Mergers and Acquisitions.

"Given that, you'd expect the big guys to buy up the little guys. Oddly enough, that hasn't happened."

But Loral has paired up in a satellite system with QualComm Inc., the San Diego company that is the only one actually operating a mobile satellite communications

business. Loral, through Ford Aerospace has been in the satellite business for while, Demisch said.

"For them to be active is certainly not surprise," he said.

Neither is TRW, which makes satellites for the military, said industry analysts.

"TRW has bid on (building) our satellites. They want to break into the commercial satellite market," said Ruth Pritchard-Kelly, a spokeswoman for American Mobile Satellite Corp. The Washington company is a consortium controlled by Hughes Communications and McCaw Cellular, which is the only licensee to provide full mobile satellite communications services.

Until recently, the mobile communications market was thought to be dominated by American Mobile — using large, \$100 million satellites — and Motorola's Iridium system employing little ones. That seems to be changing as American Mobile's license was placed in jeopardy by a recent U.S. District Court decision questioning the FCC granting it a monopoly status. And analysts have started questioning Iridium's project as too costly, too high-tech and requiring too much space in the spectrum.

All of the proposed systems need licenses and frequency allocations from the FCC before operating, and another one from the World Administrative Radio Conference to operate internationally, which requires at least a year's wait.

Industry watchers say the market for mobile satellite communications is growing fast but probably cannot sustain all the proposals and some will be weeded out.

Besides Loral's and TRW's proposals others include:

- Defense Systems, which has paired with Pacific Communications Science Inc. of San Diego and Microsat Launch Systems of Herndon.

- Orbital Sciences, which wants to to up 20 satellites each only weighing 35 pounds, for location and limited messaging services.

- StarSys Inc. of Washington, which filed for a similar service with 24 satellites.

- Ellipsat, which plans a much cheaper system, costing less than \$100 million. The Washington company plans to market its services to cellular companies so they can provide long-distance services to their customers.

- American Mobile, the only one that wants to use two large, geostationary satellites.

- Motorola's Iridium, which would use 77 satellites and cost about \$2.3 billion.